and very thoroughly explored in recent years by several Russian travellers, while Mr. Ney Elias has done much to make known its peculiar features. The three French travellers seem to have suffered much during their journey across this mountain mass, especially from the extreme cold and the rarefaction of the air. They had frequently to throw themselves down upon the snow from exhaustion. These enforced halts were taken advantage of by M. Capus to register the pulse-beats of himself and his companions; he found the mean number per minute rise to 170.

THE Danish Expedition to the coast of Northern Greenland has just returned to Copenhagen. It has been absent since the spring of 1886, and was directed by Herr C. Ryder. During the two summers it was enabled to proceed from lat. 72° to lat. 74½°. It investigated the Upernivik glacier during the winter. Many meteorological, magnetic, and astronomical observations were made, many anthropological measurements were taken, and botanical and zoological collections have been brought back. The investigations of the western coast of Greenland are not likely to be continued for the present.

THE Dutch Geographical Society has abandoned its plan of sending a scientific expedition to the Dutch part of New Guinea, but intends sending one to the Key Islands instead. The researches will not only be ethnographical and anthropological, but especially botanical.

AT the recent meeting of the French Association M. Schrader described the results of his ten years' study of the Pyrenees, which has led him seriously to modify previously accepted ideas upon the contour and structure of that range. According to the old descriptions the mass of the Pyrenean Chain was comparable to a fern-leaf with its transverse nerves, or to the backbone of a fish. In reality the Pyrenees consist of a long series of lines of elevations oblique to the imaginary axis of the chain, with which they often form an acute angle. It is impossible to look at the network exhibited in the map by the valleys and the ridges without being struck with the extreme precision of the meshes. These meshes are broken up in all directions, the slopes, however, presenting very different aspects. On the French side the crests are blunted. The incessant humidity of the atmosphere has used them up; mountains, ravines, crests, all are effaced to assume the form of juxtaposed cones or pyramids. On the Spanish side, again, the fractures have remained much fresher, the angles sharper, the forms rougher, due no doubt to the much drier climate of the south side. The slope on the Spanish side is very gradual, while on the French side the mountains rise like a wall.

To the *Zeitschrift* of the Berlin Geographical Society (Nos. 129–30), Herr Erich von Drygalski contributes an elaborate paper of over 100 pages on the deformations of the earth's form during the Glacial epoch. Dr. Oppel brings together much useful information on the religious conditions of Africa, his map showing very strikingly the distribution of the various forms. The whole of North Africa is covered with the Mohammedan tint (with the exception of Abyssinia and part of Algeria), coming down on the east to beyond the equator. Different shades of the tint show the oldest Mohammedan region as a narrow fringe along the Mediterranean. A lighter tint indicates the spread of Islam from the eleventh to the seventeenth centuries, and the lightest the broad belt in the south, which has been included during the present century.

THE HARVEIAN ORATION.

AT the Royal College of Physicians, on Tuesday afternoon, the Harveian Oration was delivered by Dr. William H. Stone. In the course of his remarks Dr. Stone sketched the lineaments of Harvey, self-revealed, as a scholar, a lecturer, a physicist, and as a man of genial, not to say humorous, disposition, and said:—"Perhaps the most important part of my prescribed task is to draw a practical conclusion from the essentially physical and mechanical character of Harvey's great discovery. That Harvey himself fully knew this, has been shown in his own words; it is also by his division of anatomy into three parts—*philosophica*, *medica*, and *mechanica*. Now, at the present time, investigation and research is carried on in the pathological, physiological, and therapeutical aspects of medicine, but the physical or mechanical side is somewhat neglected. For hundreds of ardent questioners of Nature who are labouring with the microscope in the biological and bacteriological laboratories, those who attack medicine from its physical side may be counted on the fingers of one hand. Nor, indeed, are the written treatises on this subject abundant, in this country at least. The 'Animal Mechanics' of the Rev. Dr. Haughton, of Trinity College, Dublin, is an exceptional work of great value, which has hardly received the attention it deserves from the medical profession, but it stands almost alone as the representative of its class. On the Continent, however, and in America the case is very different. The admirable 'Medical Physics' of Prof. Wundt, of Heidelberg, has been translated from the German into French, with valuable additions, by Dr. Ferdinand Monayer, who regularly lectures on medical physics at the Lyons Faculty of Medicine, and affords a storehouse of information of the highest value to the medical practitioner. Dr. John C. Draper, Professor of Chemistry and Physics in the Medical Department of the University of New York, has also made a valuable contribution to the literature of this subject in his text-book of 'Medical Physics,' published the year before last. There is, indeed, a small but scanty manual by Dr. Macgregor Robertson, the Muirhead Demonstrator of Physiology in the University of Glasgow, published in Cassell's Student's Series, but it is entirely unfit to compete with the two exhaustive treatises named before. As with the bibliography, so with the teaching. With the exception of a course of lectures which the present speaker has delivered since 1871 in St. Thomas's Hospital, I am not aware of any systematic attempt in London to teach the medical student the vast mass of physical facts which underlie the daily practice of medicine. This College, however, forms an honourable exception, for it has on two occasions kindly given me the opportunity to bring before my brother physicians some few of what our Harvey terms *nova vel noviter inventa*, respecting the physical basis of auscultation in the Croomian, and the electrical conditions of the human body in the Lumleian, lectures of a few years back. It is true that the University of London in its preliminary scientific examination for the degree of Bachelor of Medicine requires students to satisfy their examiners in physics by means of a written paper. But this paper is the same as that set to Bachelors of Science not medical. It is a terrible stumbling-block to the rising medical generation; it bristles with what the late genial Prof. De Morgan, himself a mathematician of the highest order, delighted to call mathematical conundrums. It is set by pure physicists, who know nothing and probably care little for the problems which interest us as medical men. It contributes a large percentage to the slaughter of innocent aspirants to the higher degrees in medicine, on which one of their most distinguished graduates, now Censor of this College, has feelingly and righteously commented. In the sixteen years during which I have carefully read the papers there set I have never once seen a question directly or indirectly bearing on the physics of medicine. The fact is that the large, difficult, and somewhat heterogeneous branch of knowledge connoted by the word physics is rapidly splitting into several independent portions. There are now distinctly molecular, mathematical, industrial, and physiological physics. It is the last of these with which we are concerned. The third or industrial branch has been enormously developed of late by the technical colleges at Bristol, Manchester, the City Guilds' at Kensington, and elsewhere. The mathematical branch is well cared for by the two old Universities of Oxford and Cambridge, but the physiological section has been hitherto hardly enough recognized by our teaching bodies. Surely an earnest student should be able somewhere to obtain information as to the natural laws on which the stethoscope, the microscope, the ophthalmoscope, and the sphygmograph are founded without having to wade through interminable problems on the C.G.S. system of units, or vortex theories of matter, or, chimera of chimeras, the possibility and advantages of four-dimensional space. It is to the promotion of this particular branch of study by means of experiment that it is this day my duty to exhort the College. An admirable opportunity exists, for in April of the present year the Committee of Delegates appointed by this College and the Royal College of Surgeons of England reported: (1) That it is desirable to utilize the vacant ground adjoining Examination Hall for scientific purposes, under the control and management of the two Colleges. (2) That the 'scientific purposes' be, in the first place, the investigation and exposition of such branches of science connected with medicine and surgery as the two Colleges may from time to time determine. The College has

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subsequently adopted the report. Now I submit with the utmost respect, but with the greatest earnestness, to those here assembled, that a course of physiological physics to be delivered in the new College of Science would be a real boon to all students of medicine, whether they had succeeded in obtaining their diploma or not. The human body is a mass or congeries of separate machines, susceptible of mechanical explanation; but, setting aside the heart and lungs, already named, how many students have their attention specially drawn to Donders's and Landolt's optical researches on the eye and eyesight, or to Helmholtz's account of the mechanism of the ear? Such a course, moreover, would in no way clash with other courses given elsewhere on different branches of the same subject, and it would eminently fulfil, the exact purpose even to the very words of the great man whom we are to-day met to commemorate."

THE BRITISH ASSOCIATION.

SECTION C—GEOLOGY.

Preliminary Note on Traverses of the Western and of the Eastern Alps made during the summer of 1887, by Prof. T. G. Bonney, F.R.S.—The first traverse was made along the line of the Romanche from near Grenoble to the Col du Lautaret, and thence by Briançon over the Mont Genèvre and the Col de Sestrières to Pinerolo, at the edge of the Italian plain. The second went from Lienz, across the central range of the Tyrol to Kitzbühel, and the rocks of this range were also investigated at other places. During both traverses the author had the advantage of the assistance of the Rev. E. Hill, who had accompanied him on a similar journey in 1885. The results of their examination fully confirm the views already expressed by the author as to the nature and succession of the crystalline rocks of the Alps.

(1) The lowest group consists partly of modified igneous rocks (which indeed occur at all horizons), partly of gneisses of a very ancient (Laurentian) aspect.

(2) The next group, up to which there seems a gradual passage, consists mainly of more friable gneisses and moderately coarse mica-schists (Lepontine type). This group is commonly less fully developed in the above districts than in the Central Alps, having probably been removed by very ancient denudation.

(3) The third group has an enormous development. It forms a large part of the Cottian and Graian Alps, and it flanks the central axis of the Eastern Alps on both sides, often passing beneath the ranges of Secondary strata which here form the northern and southern ranges. It has been traced almost without interruption from east to west for more than 50 miles on the southern and 80 on the northern side of the central range. It has a very close resemblance in all respects to the uppermost group of schists in the Central Alps, found to some extent in the Lepontine and yet more largely in the Pennine Alps, and the author fully agrees with the Swiss and Austrian geologists in regarding it as in the main a prolongation of the same series. It is characterized especially by rather dark-coloured mica-schists, often calcareous, sometimes passing into fine-grained crystalline limestones, with occasional intercalated chloritic schists, especially in the lowest part and with (rarely) quartz schists.

(4) The Carboniferous and Secondary strata infolded or overlying in the Western Alps section, and the Palæozoic (? Silurian) and Secondary strata succeeding the metamorphic rocks in the Eastern Alps, are comparatively little altered and are each readily to be distinguished from the above.

(5) The succession of strata in the third group is inexplicable unless it be due to stratification; in the second this explanation appears highly probable; and in the first not more difficult than any other.

(6) As groups of rocks with marked lithological characters occur in like succession over a mountain chain measuring above 400 miles along the curve, and sometimes at distances of 40 miles across it; and as these groups correspond with rocks recognized as Archæan elsewhere, which exhibit like characters and sometimes a like order of succession, the author thinks a classification of the Archæan rocks by their lithological characters (using the phrase in a wide sense) may ultimately prove to be possible.

(7) The views already expressed by the author as to the distinctness of cleavage-foliation and stratification-foliation have been fully confirmed by the examination of the above districts. He believes that the failure to recognize this distinction is the cause of the contradictory statements with regard to the relation of foliation and bedding which have been made by so many excellent observers, and lies at the root of much of the confusion which exists on the subject of the so-called metamorphic rocks.

The Origin of Banded Gneisses, by J. J. H. Teall.—The author first discussed the meaning of the term gneiss. This term was generally understood to denote a more or less foliated rock of granitic composition. Dr. Lehmann had proposed, however, that it should be used in a structural sense only, as meaning a more or less foliated plutonic rock. He would thus speak of granite-gneiss, diorite-gneiss, and gabbro-gneiss. The author called attention to specimens illustrating gneissic structures in acid and basic plutonic rocks. When various examples of gneissic rocks—that is, rocks of the composition of plutonic igneous rocks but possessing parallel structures—were compared, two types of parallel structure might be recognized; the one characterized by a parallel arrangement of the constituents, the other by an arrangement of the constituents in bands of varying mineralogical composition; thus, bands having the mineralogical composition of a diorite frequently alternated with others having the composition of granite. He proposed to discuss a possible mode of origin for the banded gneisses of the latter type. It was now admitted that those of the former type were largely due to the plastic deformation of masses of plutonic rock either during or subsequent to the final stages of consolidation.

Many observers were, however, still inclined to believe that those of the latter type could only be accounted for by supposing that the original materials had accumulated by some process akin to sedimentary deposition. Now a possible mode of origin for these could be found if we could show: (1) that plutonic masses are liable to vary in composition, and (2) that such masses are occasionally deformed either during or subsequent to their consolidation. Scrope long ago proved that the laminated structure of certain volcanic rocks (liparites) is due to the plastic deformation of heterogeneous masses of acid lava. Any heterogeneous lump if deformed into a flat sheet will show laminated or banded structures, because each individual portion must of necessity take the form of the entire mass. Scrope not only proved this, but called attention to the similiarity between the structures of acid lavas and those of gneisses and schists. ("Geology of Ponza Isles.")

The author then proceeded to refer to illustrations of the fact that plutonic masses do vary in composition. He referred to the so-called contemporaneous veins, which are often more acid, and to the concretionary (?) patches which are often more basic, in composition than the main mass of the rock with which they are associated. He also referred to cases in which granite and diorite may be seen to vein each other in the most intricate manner, and especially drew attention to the photographs taken at the Lizard last year illustrating this feature. If complex masses of the kind referred to were deformed after the fashion of the acid lavas described by Scrope, then banded and puckered gneissic rocks would necessarily result. He then showed that in the Lizard district the banded rocks of Prof. Bonney's "granulitic series" were continuous with masses in which granitic and dioritic rocks could be seen to vein each other in the most intricate manner, and that the constituent bands of the granulitic series were composed of rocks petrologically identical with those of the igneous complex. He did not mean to imply that the deformation was connected with the intrusion of the plutonic masses. He was rather inclined to regard it as due in the majority of cases to mechanical forces acting posterior to consolidation. The uncertainty which might exist as to the precise conditions under which the deformation was affected did not invalidate the main conclusion, which was that a banded structure in rocks having the composition of plutonic igneous rocks was no proof that the latter were not of igneous origin.

On the Occurrence of Porphyritic Structures in some Rocks of the Lizard District, by Howard Fox and Alex. Somervail.—Prof. Bonney has described a porphyritic diabase which is seen on the shore at Polpeor; it cuts, in an intricate manner, through micaceous and hornblendic schists. The authors have traced this rock further, and have recognized a porphyritic structure not only in many dykes and intrusions along the coast which cut through the serpentine, but also in the darker bands of Prof. Bonney's

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